

May 25, 1959

# Aviation Week

*Including Space Technology*

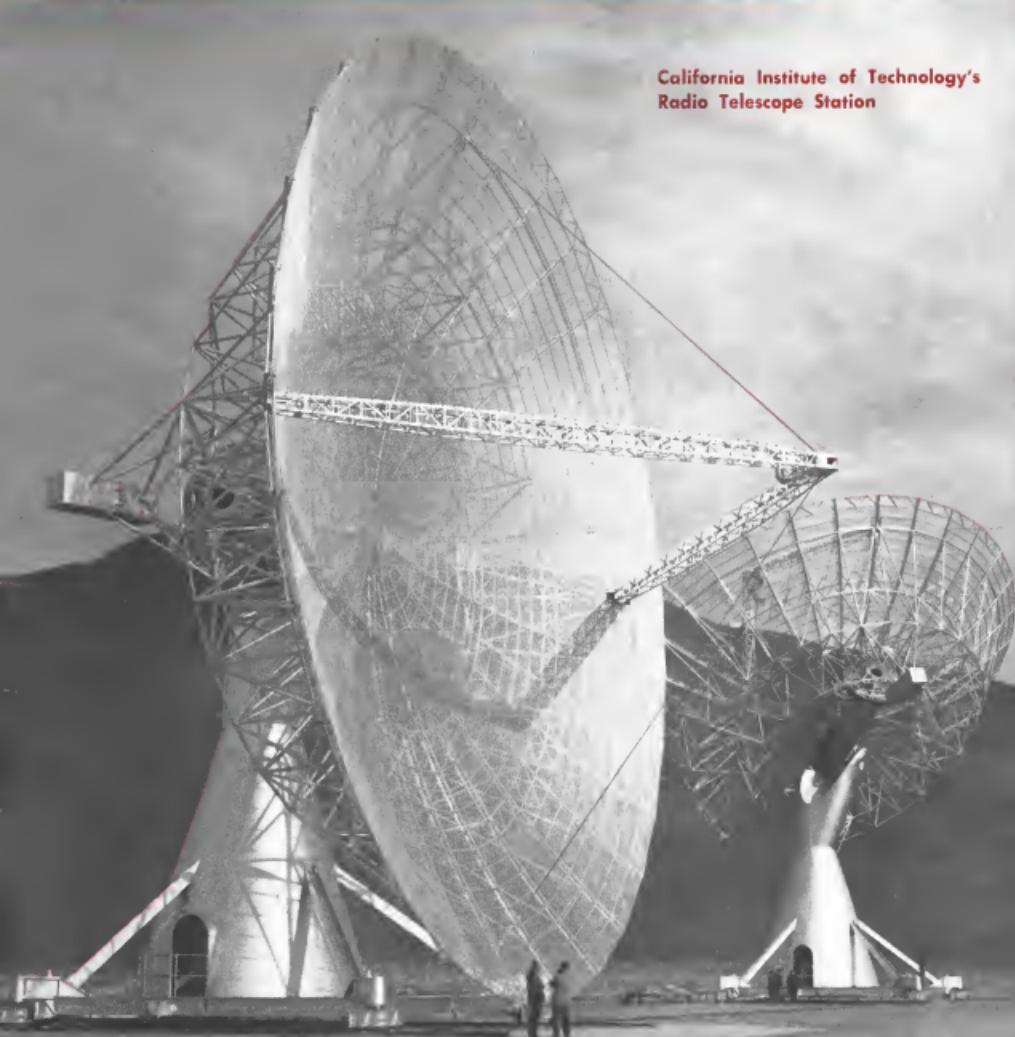
75 Cents

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SPECIAL REPORTS:

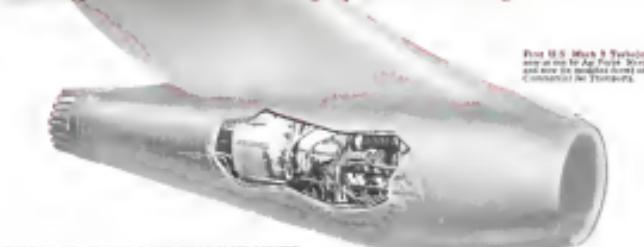
- Atlas Bases
- Titan Testing

California Institute of Technology's  
Radio Telescope Station



**Kaylock nuts...built to "play with fire!"**

America's most powerful Turbojet Engine points its nose at Mach 3. At these speeds, critical components endure enormous stresses. Fasteners must be built to literally *play with fire*. That's why Kaylock high tensile, all metal, lightweight, self-locking nuts—1,050 per unit—were entrusted to fasten components of the compressor rotor of this high performance engine.



Past U.S. Mach 3 Turbojet  
now in use by Ag. Force, Navy  
and now its modified form in  
Commercial Air Transport.

**TYPICAL KAYLOCK ENGINE NUTS**



**WHY KAYLOCK?** Because only Kaylock nuts offer advantages every design engineer wants—

**RELIABILITY**—every thread carries full load. Kaylock nuts have no weakening slots. No bolt is "stress riser."

**LIGHTER**—Kaylock Jet Engine Nuts are approximately 30% lighter than old style nuts.

**SMALLER**—Kaylock nuts have smaller envelopes. Use smaller washers. Permit bolt center line to be nested closer to load.

**SELF LOCKING**—Ratchet, elliptical locking device insures consistent self-locking torque. No sharp edges slot to cut into threads of mating bolt.

Home Business Protection®  
Send for Kaylock's new 168,000 pg Catalog. Our com-  
prehensive, 6-color Catalog is complete, brief and easy to

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All metal self-locking nuts

**KAYNAR MFG. CO., INC.—KAYLOCK DIVISION**  
Phone office and plant: West Box 2005, Terminal Annex, Los Angeles 54 California. Branch offices, warehouses and representatives in Wichita, Kansas; New York, N.Y.; Atlanta, Georgia; Canadian distributor: Alcanon Inc., Lévis, Quebec.

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**So Durable,** it can be launched from bases areas where  
there are no fixed ground reference points and strike a pre-  
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**So Precise,** it can hit its objective with a single  
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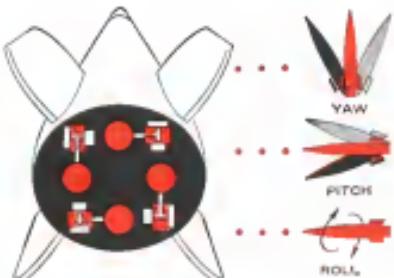
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Plants in Akron, Ohio, and Edithfield Park, Arizona



In rocket-engine and missile testing ...



**CompuDyne NOZZLE ACTUATION CONTROL SYSTEMS**

Mitsubishi engineers can design a profitable rocket system for their time and money with a new CTDC developed Neutral Atomization Control System.

Utilizing computer-controlled techniques and high-speed, high-force, electro-hydraulic actuators, the system permits accurate dynamic steering of nozzle seals shortened greatly and the dynamics of the nozzle-pitching system during static engine tests. With pitch-limiter compensation, a rapid fed programmer rates pitch, yaw and roll control correction signals as they might occur at the course of a ground cycle flight. The system's position-controlled actuators and responsiveness are faster than one part in 1000.

Retained in a complete performance parameter package is this Computer Control System—a set of many dynamic load systems developed by CDC for the aircraft model and modal subsections included are programs for Rocket Propulsion Control for Reentry Landing of Astronauts; for Blowdown and Compression; Wind Tunnel; Dynamic or Function load systems have one thing in common—they have all been built upon a broad base of theoretical knowledge coupled with practical experience in the very complicated field of dynamics control.

Der Berliner erläutert es Baudro-  
Gyna-Gesamt-System für endo-  
und exolet-Heating mit Hilfe ei-  
nem Diagramm.

Supplementary to Major Cities

**CompuDyne Corporation**  
Division of BSR Computer Services Inc.  
Manufacturers of Computer-DyneLink Parallel-Serial Units  
421 S. Worrell Street, Norton, Pennsylvania

## AVIATION CALENDAR

(Continued from page 55)

June 21-24—Seventh Pacific General Meeting and Air Transport Conference, American Institute of Electrical Engineers, Olympia Hotel Scotts, Wash. June 22-24—Meeting, Aviation Dept., Manufacturers Association, St. Paul Hotel, St. Paul, Minn. Conf. Call

June 24—Sixteenth National Symposium Nuclear Radiation, Brown University, School of Applied Mathematics, Falls Church, Va. July 1-4—National Convention, International Brotherhood of Teamsters, Hotel Washington, D. C. Session in honor of Radio Engineers' Professional Group on Military Electronics

July 26-July 1—Summer session on Planets—In Michigan Preprints Dept. Univ. of Michigan, Ann Arbor, Mich.

July 1-4—Radio Frequency Components, Hotel Astor, New York, N. Y.

July 4-8—All-Wave Transistorized Solid State Electronics, Miami, Florida, Miami Beach, Fla.

July 10-12—All-Wave Transistorized Solid State Electronics, San Jose, Calif. 1941

July 18-20—Long Beach & Catalina

July 16-17—Third biennial post meeting, Radio Technical Committee for Standardization and Los Angeles Section of the Society of Broadcast Engineers, Ambassador Hotel Los Angeles, Calif.

July 26-29—Quarterly Regional Meeting, Los Angeles Division Airlines West and United Airlines, Works

Aug. 30-31—Quarterly Regional Meeting, Los Angeles and Transpacific Airlines, San Francisco, Calif.

July 19-21—South Annual Symposium on Computers and Data Processing, David Research Institute, Sunny Hill, Calif. Full Proc. Call

Aug. 1-4—Annual Western Regional Meeting, American Association of Scientific Manufacturers Hotel, Los Angeles, Calif.

Aug. 1—William F. Draper, Director Convalescent Center on the problems of hypertension and space flight, Stanford University, Calif.

Aug. 17—First National Ultrasonic Symposium, Institute of Radio Engineers, Pennsylvania Club, Philadelphia, Pa.

Aug. 17-19—National Symposium on Ultrasonic Frequency Measurements, Standard University, Standard Cold Spring Harbor, Long Island, N. Y.

Aug. 20-22—Annual Meeting, Am. Committee Institute of Radio Engineers, Con Phila. See Previous Column

Aug. 24-Music Devices Symposium, Stevens Rockville Center, Northwestern University, Evanston, Ill.

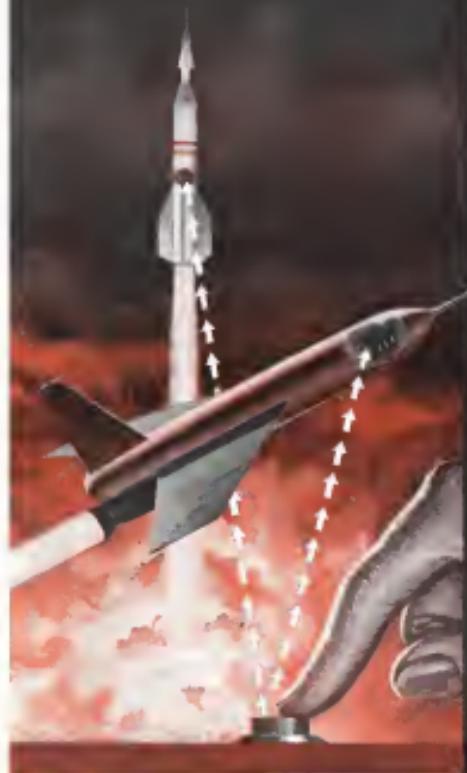
Aug. 31-Sept. 1—1941 Annual Congress International Astronomical Federation, Chancery House, Westminster, London

Sept. 2-4—1949 Congress Linguistics Conference, University of California, Berkeley, Calif.

Sept. 3-18—1949 Faraday-Rong Displacement and Calibration, Society of Royal Engineers, Royal Engineers' Technical Conference, Farnborough, Eng. land

Sept. 15-17—1948 Exposition and Operations Symposium, Newark Corp., Newark, N. J.

Oct. 12-16-19th General Convention of the International Air Transport Assn.



**Global Green marketplace for qualified solutions and suppliers – with direct delivery.**

**Avco / Crosley**



**From Crosley...**

## **Command Receivers for Drones and Missiles**

**Designed** and manufactured by Avco's Crowsley Division, Command Boosters are standard equipment aboard most of the nation's missiles. Their job: To receive and act upon instructions from the ground to destroy the missile when its flight path indicates the missile has gone awry.

In a missile configuration, the Command Electronic weight only 12 pounds, has three channels and incorporates a decoder and power supply in a single pressurized package.

A second version of the Command Browser, employing 12 channels for radio communication, is used in high-performance drones and gliders. In such applications, the Command Browser actuates control surfaces, directs engine operation and spurs the recovery parachute—all by radio-converged instructions from the ground.

**A Product of Crossley Engineering,**  
the Crossley Receiver has proven itself  
for the fitter by the job it is doing  
in the mines and dressing of today.

For more information, write to:  
Vice-President, Marketing-Defense Products,  
Dept. W-30, Crosley Division, Amoco Corporation,  
1229 Arlington Street, Cincinnati 36, Ohio.

This is the twentieth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in the field. Consulting men of broad experience who may find it useful to review fundamentals from time to time.

## Flame-Hardening Alloy Steels

When the surface of steel is subjected to direct application of flame and heated above the transformation range, then hardened by quenching, the process is known as flame-hardening. Its primary purpose is to surface-harden without affecting core properties. Jets of flame are played directly on the steel, and hardness penetration can be made to vary considerably. Usually in alloy steels this depth will range from .03 to .08 in., the actual figure depending upon the method of heating and quenching used.

Unlike carburizing, flame-hardening does not involve the absorption of extraneous elements by the steel. There is no alteration of the chemical composition. To put it simply, the steel must have its own self-hardening characteristics, cannot be dependent upon carbonaceous salt baths, gases, etc.

Flame-hardening is not a substitute for the conventional furnace method. Each has its uses. The particular virtue of flame-hardening is that the flames can be directed to localized areas. The furnace, on the other hand, is generally more economical and feasible when parts produced in large quantities must be hardened all over.

Any type of hardenable steel, alloy or carbon, can be flame-hardened, and there will usually be an scale or plating. The alloy content is the governing factor when determining the quench. In some cases a rapid quench is required; in others, it can be as slow as air-cooling. Tempering presents no problems, for flame-hardened steel can be tempered as if hardened to the same point by other methods.

A list of typical flame-hardened parts would include such familiar items as gear and sprocket teeth, and certain types of cams and rollers, shoe treads, etc. This list is by no means exhaustive; it could include many other parts that often require a localized hardening treatment, especially for wear-resistance.

When seeking information about flame-hardening methods, please feel free to consult with our technical staff. Bethlehem metallurgists will gladly cooperate, and you can depend upon their suggestions. You can rely on Bethlehem, too, as a source of alloy steels, for Bethlehem makes the complete range of AISI standard grades, as well as special-analysis steels and all carbon grades.

BETHLEHEM STEEL COMPANY  
BETHLEHEM, PA

On the Results Committee meetings are held at Bethlehem, Pittsburgh, Cleveland, Chicago, St. Louis, Boston, and New York. Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**



First with commercial trans-seas jet service using U.S.-built planes, Pan American has halved flying time between world capitals and other major cities. The 650 mph-red speed at which Boeing 707 jets fly, accords the need for top reliability of air navigation, radio, other electronic equipment... and all tubes and components.



Sayis F. SHEPHERD, Foreman—Composite Overhaul,  
Pan American World Airways System.

## "Our fast jet flights call for the dependable performance 5-Star Tubes like this give!"

"It's the second hand of your watch that tells off the miles when you travel in Pan American's big jet planes. To maintain our fast schedules, pilots and co-pilots are guided by electronic equipment of the most advanced type now available.

"A 'something extra' guards the reliability of this equipment... G-E 5-Star Tubes. We've used them for many years in our piston planes. We know they're dependable, know they will outperform and outlast regular precision tubes."

"They're manufactured for the needs of the new super-speed air age. So... Pan American employs General Electric 5 Star high-reliability tubes in critical sectors to make jet travel still safer, easier, more pleasant."

See your nearby General Electric tube distributor for 5-star types! He gives "jet" delivery service! Distributor Sales, Electronic Components Division, General Electric Company, Oneida, New York.

*Progress Is Our Most Important Product*

**GENERAL** **ELECTRIC**



Understandably unwelcome in King Cold's domain . . .

## Heating Blankets and other Woven Heating Elements by SAFEWAY can make your **COLD** problems OLD problems!

Be it the frigid climates in which aircraft fly, the cold, breathless space down in missile and satellites, or the icy arctic wastes of DEW Line installations — it's always "winter" somewhere.

Environmental temperature problems extremes to this kind of "winter" heat such tasks and functions and keep the operations of many types of sensitive equipment.

But SAFEWAY dispels such problems by packaging controlled heat for operations everywhere. Among the wide variety of heating blankets and woven-wire

heating elements which have been engineered by SAFEWAY to meet exacting specifications are:

- heating elements for heating equipment and for electronic gear, computers, computers, servos and servos — for missiles or aircraft
- heating units for coated surfaces
- heating elements for all types of general support equipment
- defrosting units for Industrial and commercial refrigerators
- heating blankets for insulation and insulation heating

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heat-filled folder,  
please write

# Safeway

HEAT  
ELEMENTS  
INC.

If it has to be heated (and the "it" can be almost anything), you can rely on SAFEWAY engineers to study your problem carefully, and — without any obligations — submit an appropriate recommendation.

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WITH MAGNETIC AMPLIFIERS, INC.  
**SOLID STATE-STATIC PROGRAMMER**

Programmer equipment which provides a flow of switching functional commands—approximately spaced in time—is mandatory for successful operation during the critical count down phase of missile launching.

The Automatic Programmer shown utilizes a Stack-pak® system and accomplishes precision timing, switching and sequencing for sequential count down commands as initiated by the Timing Unit, capable of sequencing down from 999 seconds in 0.1 second intervals with an accuracy of 1% +/- The Switching Unit picks off the same pulses and employs Stack Pak® magnetic switches to control 27 functions—of 20 words output per function. Visual display is provided for timing and response for each function.

Automatic monitoring of each function is accomplished by the Verification Unit. It provides response signals of the status of conditions for each function and will self-inspect random logic upon reconnection. The Automatic Programmer is the latest addition to Magnetic Amplifiers, Inc., product group of Solid State-Reliability Assured Systems.

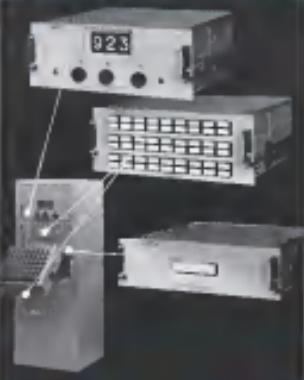
### MISSILE CHECKOUT EQUIPMENT

#### SIMULATORS

#### STACK-PAK® SWITCHING SYSTEMS

#### SPACE AND SUBMARINE AUTOPILOTS

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## Engineering aircraft components to meet the needs of modern speeds

More strength and efficiency with less weight . . . that's the story of the ever-increasing demands in today's and tomorrow's aircraft performance requirements.

Through vigorous design research, and constant developments in structural concepts and materials, Boeing engineers are keeping up with—and ahead of—their demands in the production of aircraft components. It's another reason for Boeing's position as leader in the design and production of major components for flight.



MAIN PLANT AND HEADQUARTERS, CHULA VISTA, CALIF. PLANT, RIVERSIDE, CALIF. ASSEMBLY PLANTS, NORTON, GA., AUBURN, WASH.

## Reliable RADAN 500

*GPL's new commercial Doppler system*



**RADAN 500** Doppler radar, GPL's all-new ARINC system, for aircraft offers the reliability and longevity of service that over 12 years of aircraft Doppler experience can insure—reliability resulting from High-precision design based on 12 years of product improvement programs. Vendor feedback on more than 1,500 operational GPL Doppler systems has placed attention to the design and maintenance philosophies of commercial aircraft.

**SELF-CONTAINED:** Ground-based and shipboard, displays directly, continuously and accurately—over the poles, over oceans, even deep sea at day or night, good weather or bad—provides a dramatic extension of airline capabilities and important operational savings.

**VERSATILE:** Capable for new jetliners, transports, light-transports, transports, paraplane, and helicopters. Write to the world's oldest experienced Doppler manufacturer for further details on RADAN 500.



## BASIC BUILDING BLOCKS

### SERVO SYSTEM COMPONENTS



Model-Servo-Drive 22-40, rev. 400, rev.

- Servo-Motor-Phase
- Servo-Valve-Resistor
- Pulse-Train-Decoder
- Encoder-Sensor
- Data-Logging
- Temperature-Controller
- High-Temperature
- 20-40 watts

### HYDRAULICS



EMI Series Valve Valve

- Servo-Valves
- Poppet-servo-Valves
- Directional-Valves
- Pressure-Valves
- Flow-Valves
- 0.1-60 gpm
- 0.01-1000 psi
- In performance
- For hydraulic or pneumatic
- Materials-needed

### COMPUTERS



Model 100 Computer

- Gated-Cycle Logic
- Microprogrammed
- Internal-Pool
- Diskette
- Analog-and-Digital
- Models-Applications

### INERTIAL GUIDANCE



Model 1000 Inertial Guidance

Inertial-guidance systems for flight, ground, mobile and space applications. Built around proven gyroscopic components, these systems provide the most accurate navigation available. Model 1000 is designed for aircraft, ground vehicles, ships, etc.

### GYROS



Model 100 Gyro

- Rate-Social Integrating
- Ring-Integrating
- Vertical-Acceleration
- Linear-Acceleration
- Two-Axis-Free-Fall
- Multi-Domed
- Three-Axis-Free-Fall
- Three-Axis-Free-Fall
- 2 Eyes, 3 and 4 Control
- Platforms
- Earth-Sensing-Thermistors

### GROUND SUPPORT



Model Support System

Completely integrated ground-support equipment based on Kevlar® flexible belt technology. Features include: integrated digital, manual, programmable control of conveyor, walk-around or stationary, walk-around or stationary.

### MICROWAVE



Antenna Array

- Waveguide, Ring
- Transmission-Line
- Patch-Components
- Antennas
- Antennas
- Transistor-Isolators
- Charge-Isolators
- Test-Set
- Transmitting-Wave-Amplifiers

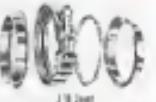
### Engines

Kearfott offers challenging opportunities in advanced component and systems development.



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J-B Joint



C-Joint  
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J-Joint



Daneel Red Coupling



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CBNS/EL Joint



Fluid Coupling



K2 Universal Red Coupling



Large Diameter  
Fluid Coupling

ANOTHER **MARMAN** FIRST!

Quick, Off-the-Shelf  
Delivery of Quality Clamps,  
Couplings, Joints

FROM OUR NEW WAREHOUSE



More than 400 different products are now available from stock in the new Marman warehouse.

With the completion of a new warehouse, Marman has initiated a unique inventory program for all off-the-shelf delivery of many types of Marman products.

Here, aircraft/helicopter engineers and buyers can select high-quality aluminum, chrome, copper, brass, aluminum-alloy, stainless-steel, and graphite clamps, couplings, joints.

#### OTHER SERVICES

This new inventory program is designed to provide better service to all of our customers by offering short-order lead times and prompt delivery. Many parts will be provided immediately; others will be produced to customer's specifications. Some aluminum and graphite clamps are normally needed for tooling and production.

**WAREHOUSE STOCKS AND SIZES**  
At present, 10 basic Marman products [shown above] fit into the inventory program.

CBNS/EL, a sample catalog.

These clamps, couplings and joints are now available at a wide range of stock sizes, styles and materials that include 450 separate part numbers. All other products may be made-to-order, they will be added to this list.

#### INDUSTRIAL CUSTOMERS

Another way Marman customers advantage is the reduction of unit costs of purchased items. This is possible because special production runs, minimums, prices, etc. are not required. When production runs are required, better rates are given. Costs of manufacturing materials can be made. All of these savings are reflected in the new off-the-shelf prices.

For information on the inventory program, including part specifications, sizes, materials and prices, call now available.

CBNS/EL, a sample catalog.

Mail this coupon for full details.

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**MARMAN DIVISION**  
**Aeroquip Corporation**

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## The Navy's Versatile Vigilante

...an all-weather attack weapon system with unlimited talents for limited war

Versatility means the ability to do several things well—but frequently not to excel in any one of them.

Not so with the Navy's new A3B Vigilante. It can perform a wide variety of missions—yet its sharply increased performance in each would justify building it as a single-purpose airplane.

This is the kind of versatility that heralds the high cost of today's fiber-optic-electronics weapon systems—provides the right muscle for every mission—turns enormous budgets into monies for peace.

With Vigilante in about 6 months, the Navy will have

glide-ranging power to conduct limited war—from bomber to tender.

For the Vigilante will deliver any weapon—bomb or missile, conventional or nuclear—day or night, in any weather, at any altitude, from any altitude, a full thousand miles from its carrier. No target can hide from its radar eye. It can be used as a raider in limited war ... as a blimp in all-out conflict.

The Vigilante is now in flight evaluation for the Navy. Designer and builder—the Columbus Division of North American Aviation.

THE COLUMBUS DIVISION OF NORTH AMERICAN AVIATION, INC.

Columbus, Ohio



## for critical welding

### P&H Combination AC-DC Welders

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These dual-purpose welders are ideal for super-critical welding because they offer you:

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# Aviation Week

## Including Space Technology

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DOW

MAGNESIUM PRODUCTS



A. SATELLITE

The rocket carried one of the weather satellites to make temperature maps. It is 13.29 ft. long with gold and white materials to reflect heat.

B. SATELLITE STAGE TEST

The idea is to test at 100,000 ft, re-entering the atmosphere at about 1000 ft/min. The stage after separation has a pressure cabin with thermal insulation of 300 ft. and about 1000 ft. of insulation.

C. SPACER SECTION

The idea is to prove that ACM magnesium alloy sheet structures can be made in light weight and high strength structural metal.

D. TARGET

Target 4200 ft. in a range of 4000 ft. was chosen because it is the world's highest mountain range.

## LIGHTWEIGHT MAGNESIUM SPEEDS WEATHER ROCKET FOUR WAYS

The shell of the missile and several parts of the Rocket are made of standard magnesium-aluminum and magnesium-thorium alloys. Why was magnesium chosen for this project? Because it is the lightest commercially available metal that could be easily fabricated into a high strength to weight ratio and able to withstand elevated temperatures encountered during flight. Magne-

sim alloys met these demanding requirements as proved by tests conducted by the Naval Research Laboratory in Washington, D. C.

Write today for new literature brochure on aircraft, car, ship and mobile. Contact the nearest Dow Sales Office or write to THE DOW CHEMICAL COMPANY, Magnesium Products Sales Dept., Midland, Mich., Dept. MA130255-25.

**THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN**

## EDITORIAL

### Canadian Aviation's Fifty Years

Canadian aviation is marking its fiftieth anniversary this year. The first aircraft in Canada lifted off the frozen lake surface at Baddeck, Nova Scotia, on Feb. 23, 1909. The Silver Dart biplane piloted by J. A. D. McCurdy was significantly the product of a joint Canadian U.S. venture that established a pattern of cooperation that still holds true today. It was in 1907 that Alexander Graham Bell founded the Aerial Experiment Association with Canadian McGeech and F. W. "Casey" Baldwin and, from below the border, Glenn Curtiss and Lt. Thomas Selfridge on leave from the U.S. Army.

This was the beginning of the Canadian aircraft industry that today is the third largest industry in the Dominion, employing about 35,000 people and working with a value of goods and services produced.

Canada contributed its share of top World War I fighter aces. Ten of the Royal Air Force's 27 leading aces were Canadians, and the aces of Billy Bishop, Barnard Coffey, W. G. Barker and Ray Brown堪称 the legends of air combat in the cause, war and peace era.

Between wars, Canadian aviation played a significant role, as it still does, in opening up the natural resources of the vast northern reaches.

The Canadian "bush pilot" with his pontoons and skis, risking landing fields of the arctic wilderness lakes to gain open inaccessible territory from the sun. Today, Canadian aviation operators, many of them little known outside their immediate areas, are performing spectacular jobs in remote bushels where nothing but airborne vehicles can operate. These jobs include the aerial supply of the DEW and DAD Canoe patrols, the suppression of the bison bloat that used a multi-billion dollar paper pulp crop in New Brunswick, the construction of a railroad by air supply in the Yukon, the transport of a massive amount of electric power lines by helicopter to harness hydroelectric power to aluminum production in British Columbia, and the massive transport of people and goods in all kinds of weather that keeps the Canadian north and west on an operating economy.

### RCAF Growth

During World War II, the Royal Canadian Air Force grew to a strength of 700,000 men and women and put 47 squadrons into combat operations overseas. Today, it provides an air defense of 150 fighters with NATO and is linked with USAF, Navy and Army units in the North American Air Defense Command, with RCAF Air Marshal C. R. Skennerton as vice commander of this joint enterprise. In fulfilling the air defense of the North American continent from supersonic aircraft and hypersonic missiles, the interests of Canada and the U.S. are inexorably intertwined.

As is so often the case in history, what was originally scheduled as a year of celebration for Canadian aviation

has also turned into a year of crisis and questions as to the future direction both the RCAF and the industry feel supports it will take.

The fine production record of the Canadian aircraft industry during World War II and its post-war performance have demonstrated an ability to compete successfully in the international market in a variety of ways.

For basic-type transports with short field landing and takeoff requirements, it has been hard to surpass the de Havilland Canada line of Beaver, Otter and Caribou.

In the art of adapting both British and American basic designs and adding a touch of its own that gives them distinctive performance, Canada has no comparative position now with the Sabre jet fighter series using the Canadian designed and built Orenda engine, the Avro arm-submarine patrol plane and now the CL-44 freighter which recently found a market among U.S. cargo lines.

The Avro Aircraft and Canadian Engine divisions of the British Hawker Siddeley group have struck out boldly in new designs with the Mach 2 Avro all-weather fighter, the flying saucer and the transonic Transair transport. But the Canadian defense budget has found it difficult to support the mounting costs of an air research and development program in the aerial weapons field. It is indeed fortunate that USAF has continued to support the Avro flying saucer project so that the validity of its principles can be determined by experimental perform-

### Possible Course

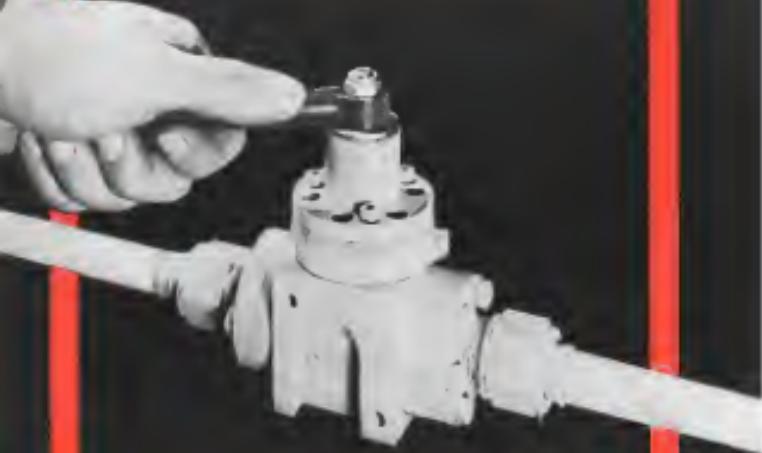
In view of the astronomical costs of modern research and development in the areas of supersonic aircraft, missiles and space vehicles, Canada's best course may be to develop cooperative programs with both Britain and the U.S., where the results of this basic research, development, design and testing can be applied to fairly well proven hardware adapted to meet Canada's specific needs and technological requirements. And, while U.S. hardware such as the B-52s are defense models it purchased for Canadian use, it is obvious that Canadian industry must be given an opportunity to compete fairly for the subcontracting and supply business associated with the weapon systems. We suspect that Canadian industry will have to be considerably more aggressive on an individual basis to make adequate progress in this area.

The continuing past in this matter of the aviation business on both sides of the border is the 12½% duty the U.S. imposed on Canadian built aircraft sold here. There is no similar Canadian duty on U.S. aircraft sold north of the border, and we feel it is very vital season for the continuation of this uncooperative measure.

Just 50 years ago U.S. and Canada citizens joined in the Aerial Experiment Assn. to by the foundations of flying north of the border, so today they must both continue to work together for the defense of the North American continent and the continued development of its sound and expanding economy.

-Robert Hets

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## WHO'S WHERE

### In the Front Office

**Charles E. Justice**, president, Rocket Power, Inc., has been appointed vice chairman of The General Corp. Mr. Justice formerly was president of General Control Societ Co. Also Frank A. Mason, executive vice president of Rocket Power.

Stephen M. Jenkins, executive vice president-engineering and research, United States Rocket Propulsion, Inc.

**G. T. Williams**, president and general manager of The Marconi Electronics Company, Inc., has been succeeded by K. G. Hill, who will remain as the company's corporate staff director, Research Corp.

**George W. Hough**, vice president in charge of the Marconi Industrial Electronic Systems Department, CBS Laboratories, Research Corp.

**R. C. Clinton**, vice president-development planning, Marconi Space Antennas, Torrance, Calif.

**Robert T. Ochs**, vice president planning, Ford-McCullough, Inc., has joined Calif. Dept. of Defense, Research & Engineering Division, Los Angeles.

**David B. McNeese**, vice president-engineering, California Instrument Corp., El Segundo, N.Y.

**Dr. Jerry Mueller** and **Don K. D. Nichols** (USA, ret.) of GEC Corp., director of GEC America, Inc., have joined the company.

**William F. Scott**, manager of Penn Aircraft Co.'s Washington, D. C., office, Vice Adm. Charles F. Gee (USN, ret.) will assume new duties at the Washington office as executive advisor to the vice president strategic relations and military contract to McNeese.

**Charles Spengler**, acting chief of the Office of Public Affairs, Federal Aviation Agency, Washington, D. C., and **Alvin W. Jenkins**, acting director of the new division, Mutual Capital Associates.

**Dr. Bruce H. Billingsley**, former president and director of Billstone, Inc., appointed senior director of research and engineering, Department of Defense. Dr. Billingsley will be in charge of Special Projects, reporting directly to Dr. Robert F. York.

### Honors and Elections

**Major Gen. Joseph D. Coffey**, director of flight safety research for the Air Force, has received the Missouri Aviation Safety Award for 1970 for having made the state's "outstanding contribution to the promotion of aircraft operating safety."

**Frederick Maschler**, managing director of Bristol Aircraft, Ltd., has been elected president of the Royal Aeronautical Society, succeeds Dr. Alan H. Hall, chief executive of Boulton Paul Ltd., London.

### Changes

**Conrad Kress**, assistant to A. G. Evans, executive vice president of Convair Division of General Dynamics Corp., San Diego, Calif., has been assigned engineer-in-charge of the company's new space and missile development center, formerly the operating division. **Walter F. Knobels** succeeds Mr. Kress as manager of industrial upgrading at Convair Fort Worth.  
(Continued on page 135)

## INDUSTRY OBSERVER

► Watch for an announcement soon of a licensing agreement between Rolls-Royce, Ltd., and the Allison Division of General Motors Corp. for manufacture of The General Co.'s RB-141 bypass engine in this country. RB-141 is an 18,000 lb. thrust class and is slated for use on the de Havilland 123 medium-range jet airliner. Biggest U. S. interest is in the Rolls-Royce RB-141 as a powerplant application in the Douglas DC-9 medium-range jet transport design.

► Martin Co. has designed a large housing simulator that would allow studies of men and equipment under conditions similar to those they would encounter at a space site. Outer chamber would simulate open environment, allow study of techniques for transferring between free space and the artificial home environment.

► Soviet development of feeding methods for use in space capsules includes a number of liquid meals and milk products with the consistency of a thick chocolate mousse soft and served in a can with a tube attached. Another mixture of ham, cheese and bread has been reduced to the consistency of toothpaste and is served in a squeezable tube.

► Sixty-six fierce turboshaft engines on new equipment is expected within the next two months. Evaluation teams of pilots and technicians have just completed testing the Dassault Mirage 3, last of a series of aircraft flown and evaluated. Possible customers include the Swedish Saab Draken, British Farnborough G.91, Grumman FTF-1F Super Tigre and the Lockheed F-104. Reports say that tests of the Mirage were highly favorable.

► Navy is considering the General Electric 2,570 shp T64 turbine engine as a possible powerplant for an escort to fit into its "stealth-plane" concept and provide a platform for the Eagle long-range air-to-air defense role now under development. T64 is also used by Navy as an STOL version of the Grumman S-2F search plane.

► Reaction control simulator for research and training of space pilots has been designed by the Xerxes Co.'s Denver Division. Splashed simulator riding on an airbag would house a space pilot and his controls. Chamber could be spun in any direction to learn what degree of disorientation pilot could withstand and still control his attitude.

► Air Force plans to shift some of its Lockheed RQ-31A Airborne Early Warning and Control aircraft with new high-power radars to extend the effective range of its SAGE defense system for guiding intercepting Boeing B-52 bombers. The first prototype North American F-108 Rapier Interceptor fighter for the program, known as Airborne Long-Range Target, or ALRT, for short, arrived on Air Force bunting on the project last week at Wright-Patterson Air Force Base.

► Watch for major insurance companies funds to go into loans to the aviation industry. Specialty is short relatively funded segments of insurance issues are available for industrial lending, and such a loan implies confidence by the long-term insurance leaders in the future growth and stability of the field. New loans by insurance companies in the last few months include \$7 million in 10% loans issued by Thielot Chemical Corp. and \$75 million in the 20-plus-months of General Dynamics Corp. Ryan Aerostatic Corp. also has just arranged for approximately \$4 million in long-term financing from an insurance company.

► Another entry in the growing list of tungsten rocket nozzle joiners is the Rocket Engine Section of General Electric's Flight Propulsion Division. GE process uses wirelike arc gun to spray tungsten on an intermediate material backed by graphite. Unlike high-temperature plasma process, GE arc process can be used to coat tungsten on any material that can withstand 375°. Company already has sold several tungsten nozzles which have been successfully test fired.

# Washington Roundup

## Nuclear Plane Decision

Defense Department and Atomic Energy Commission have assured the Joint Congressional Committee on Atomic Energy that a five-year program for construction of a subsonic nuclear aircraft prototype will soon be submitted to the President and to the Congress, probably within a few weeks.

The assurances were made late last week during a meeting of key congressional and Pentagon officials. The meeting, called by members of the Joint Congressional Atomic Energy Committee in view of conflicting statements in its whether the idea should A. Q. Quayle, Defense Secretary of Defense, had agreed to submit to the White House a program to rework his nuclear aircraft proposal, which was then forwarded with confirmation of two subsonic prototypes. Those attending the meeting were Sen. Claiborne Pell (D-R.I.), chairman of the Atomic Energy Committee; Rep. Martin Price (D-HI), chairman of the Subcommittee on Research and Development; Rep. James Van Zandt (R-Pa.), ranking Republican on the committee; John A. McClosky, chairman of the Armed Services Committee; Dr. Robert York, Defense Department's director of research and engineering; and Helmut R. Lopez, assistant to the Secretary of Defense for atomic energy.

## Financial Storm Clouds

Watch for signs of another financial crisis in the Pentagon venture to consolidate during the summer of 1987 when gross underfunding of major weapons development and procurement joins fiscal strain from the streamlining of the Defense Centers and its related technologies. Current indications are that the Pentagon's fiscal year 1988 budget will be \$50 billion short of the funds needed to finance programs proposed for Fiscal 1986, with the real pinch coming in Fiscal 1987 when the gap between program and funding may widen to as much as \$2 billion.

Failure of top Pentagon officials to cut off current programs that are going down the military dislocation curve and to make basic decisions between competing weapon systems is a major cause of the financial squeeze on new development programs. With an election year in 1988 when the fiscal 1981 defense budget will attain the decisive point and the attitudes of both executive and legislative branches of the government, it can easily devolve down the rampaging Pentagon crisis into a round of political battles.

## ARDC Streamlining

Crosscheck is being held for a major restructuring of the Air Research and Development Command by its new commander Lt. Gen. Charles A. Scherer. Major cuts will be mandatory and cross-commander and cross-theater transfers will take some pageantry by the nose, funded by Advanced Research Projects Agency, transferred funds to NASA, and launched by the services. Those fired by USAF could only serve in the First Army-launched laser probe was named "NASA." Then Pioneer IV earned the initials of both Army and NASA.

Standardizing the designation is one more attempt to demonstrate that the U.S. program is a unified, national effort.

-Washington staff

and the Florida Air Development Center into a single unit with Holloman operating as a detachment of ARDC and placing a commanding role in the ARDC.

- Concentrate major propulsion research at Edwards AFB, Calif., with existing facilities in Wright Air Development Center and Arnold Engineering Development Center absorbed into Edwards.

- Emergence of the Ballistic Missile Division at Holloman AFB as the missile warhead development center with the Atomic Missile Test Range and Particle ABF operating as its test division.

## R&D Personnel Shifts

Meanwhile, as a preliminary to any organizational change major personnel changes already have been made at ARDC. Maj. Gen. James Ferguson, former from the Pentagon as USAF director of requirements to become commander of ARDC on July 26, succeeded Maj. Gen. John L. Givens, who is returning to Gen. William M. Gortz, who now commands at the Special Weapons Center will become deputy commander of ARDC. In research, succeeded Maj. Gen. Leighton J. Davis, who goes to the Pentagon as assistant deputy chief of staff for development. Gen. Davis replaces Maj. Gen. Ralph Stennell, who becomes vice commander of the Air University. Other R&D personnel changes are:

- Maj. Gen. Victor Flanagan, now commander of the Directorate of Systems Management in WADC, will go to the Pentagon as director of development planning for the USAF space branch of staff for development, replacing Maj. Gen. Leland S. Stratton, who becomes chief of the Caribbean Air Command.

Flanagan also will inherit a small portion of the directorate of requirements which was formerly under the office of the Deputy Chief of Development. This requirement directorate, still along with most of its personnel, was recently transferred to the office of the Deputy Chief of Staff for Operations. It will be headed by Maj. Gen. Bruce E. Holloman, who is being transferred from the Tactical Air Command.

- Maj. Gen. Charles McGehee, former chief of guided missiles at USAF Spacepower, will move to Kirtland AFB in ARDC Special Weapons Center command.

## Space Unity

Unification of a sort has come by at least one part of the nation's space program. In the future, all military and space probes launched for the National Aeronautics and Space Administration will bear the label "United States" if they carry one label or all-inclusive of what agency handles the launching. Some Navy capsule models will bear their own labels. Launching costs will be paid by the services. Launching costs will be paid by the services. Those funded by ARPA, carried only service labels. First Army-launched laser probe was named "NASA." Then Pioneer IV earned the initials of both Army and NASA.

Standardizing the designation is one more attempt to demonstrate that the U.S. program is a unified, national effort.



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# New Space Tempo May Increase Support For WS-117

**Series of satellites contemplated to circle earth in polar orbit to provide continuous surveillance.**

Washington—Increased tempo of space technology, both in the U.S. and Russia, is giving strong fiscal support for Air Force's WS-117L advanced reconnaissance system, which has been largely focused thus far on a long-term basis.

Ultimate application of the WS-117L system, now being developed by Lockheed-Georgia's Military and Space Division under sponsorship of the Advanced Research Projects Agency through USAF's Ballistic Missile Division, contemplates a series of satellites—perhaps as many as a dozen. Each of these will circle the earth in a north-south orbit in a 90-min. period for continuous, effective surveillance.

Known by a variety of project code labels, including Big Brother, Pele Piggy, Sputnik and west records, Nodar, this reconnaissance satellite, may evolve into one of the most important U.S. system modules as the data acquisition potential in the satellite space sector is concerned.

The program has progressed in the past with technical funding on a month-to-month basis, although it seems probable that the program will receive some strong substantiation that the program would be beneficial. Recently Associate Vice Chief of Staff for Research and Development, Gen. George W. Brown, has learned, the program having declined to a one-day period, then was extended to cover another 10-day span.

## Early Part

The early part of WS-117L project, formerly known as Sentry/Atlas, has broken out of the one-day program by the Advanced Research Projects Agency and given the designation Project El Dorado which is now being carried out to obtain north-south polar orbiting

satellite injections from Vandenberg AFB, Calif.

Remainder of the present planned WS-117L advanced reconnaissance module program using the Centaur-based Atlas as a booster includes:

- Initial flight of the Attached-based WS-117L vehicle known as Sentry/Atlas, probably will be in January 1969. Under this timetable, the program will develop the first of a three-stage system which has a design life of 10 years. The third stage will be a two-axis attitude control unit being accelerated to include maneuvering loops. This carrier will be an ARPA/BMD project, with Lockheed's Marconi and Space Division as principal contractor. Data inserted in Sentry/Atlas will be furnished to Sentry/Atlas which will be a natural follow-on to the Dismantle program.

- By mid-1968, WS-117L Sentry school site may be established at the rate of about one a month.

- First flight of this series will be from the Air Force missile Test Center, Cape Canaveral, Fla., using the same launching facilities for the Atlas because the last four are scheduled to be made at Vandenberg AFB in time to accommodate the final phase of the program.

- Recovery capability by space will be attempted initially to reveal the

# For WS-117

area from orbiting vehicles. A second will be made by ocean, and the film package will be ejected at a predriven point in the orbit for recovery with parachutes as an expendable system.

- Advanced plan contemplates developing the exposed stage in the satellite and reading out results electronically to a ground station. This sophisticated approach, although more complicated than the film return technique, is more in keeping with the desired information from a satellite with true room surveillance capability.

- Advanced sounding development for the WS-117L program will be known as Vela (AFM Tech 71, p. 34). Plans call for utilizing software sensing equipment to determine the exact timing of antiICBM deployments in order to automatically extract the best time for initiating tracking and reentry. One benefit of the system is that the tracking equipment, the infrared sensor would be required to focus on the mid-end of the ICBM when the heat of exhaust occurs.

- Television camera imaging is not now included in the Sentry scheme.

- Previous plans for the nose cone to embody a classified configuration which could open for viewing a star projector, has now been changed. Instead of the open classified portion of the nose classified portion

was intended to be used as a window, but a novel, more efficient arrangement has been devised which will obviate the need to remove the window and the assembly for the nose cone to be open for viewing.

- Second stage of the WS-117L Sentry vehicle is scheduled to be the Bell Hustler rocket engine, now being used as the second stage of the Project Dismantle vehicle, which uses a Douglas-built Thor as a booster. The Bell liquid-propellant engine is advanced version of the plant originally designed to supplement the engine for Convair's B-52 Hustler bombers, will develop an excess of 15,200 lb thrust, using uncooled ducted combustion and stabilized jet lagging nozzle and in the present combination.

- Third stage will also be coupled to the Bell rocketstage engine, will also be uncooled ducted combustion and will utilize a nozzle which is the same scheme used for the Dismantle satellite polar orbit.

- Total weight of Atlas preflight—second stage plus unarmament forward section—and weigh approximately 5,000 lb., indicating a substantial sacrifice in payload capability over that of the Thor-based Dismantle satellite vehicle.

- Nominal orbital altitude will be 900-1000 mi. Circular or noncircular orbit will be a difficult goal.

- Responsibility for looking the navigation was cast Bell rocket engine for the nose cone and stage will be Lockheed's. The firm

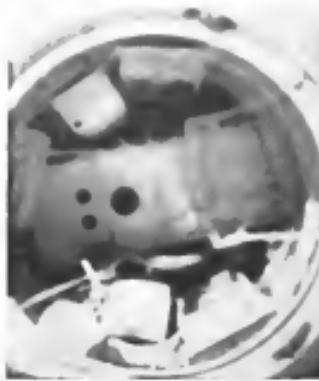
also will have responsibility for check-out and static test of the engine second-stage vehicle at Santa Clara, Calif.

A team of investigators will be associated with Lockheed on the WS-117L program. Polar Corp. will supply space-grade communication equipment.

Kurtiss-Kadet Co. and Inik Corp., Palo Alto, are engaged with responsible aerospace aspects link, in addition to having photographic capabilities, also work in the field of auto-space measurement and in information retrieval.

Under contract from Air Research and Development Command's Room, N. Y., Air Development Center, Thompson Ramo Wooldridge is working on a plan for hardware and integration of the WS-117L satellite through its Remotely Operated Data Processing Project Office. Subcontracted to Thompson Ramo Wooldridge is Southern Laboratories Corp., which is engaged with analysis in the field of photogrammetry to make data received from the satellite. The program includes use of ground equipment which handles robotics and checks perhaps the strongest reconnaissance system. That equipment probably won't be available until the WS-117L program is well under way.

In connection with these photographic calculations, orbital studies and attitude control procedures are involved, because there are both related to the photogrammetric analysis.



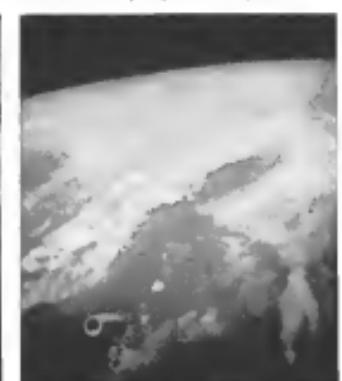
**SEPARATION** of an Air Force Thor satellite from its Atlas booster (left) occurred 115 sec downstream from Cape Canaveral, Fla., was photographed by a 15-mm AGC Electronics Corp. camera mounted in a separate vehicle during charged by General Electric. Sequence indicates instantaneous potential of WS-117L. Field of view diameter was 31 deg. Separation point is on the left side of 90 mi., shown (from left) toward end of the booster a few seconds after separation; the booster as it begins to drag away.



AVIATION WEEK, May 26, 1968



the entry vehicle continued on a programmed ascent to a 500-m. apogee, the booster falling farther back and rotation of the earth increasing rapidly (left) and (right) the booster falling slightly to the right. Load was at the Florida area and a weather front moving toward the area can be seen. Data capsule, which weighed 60 lb, was automatically ejected from the entry vehicle and parachuted down; recovery was made by an Atlantic Marine Rescue vessel 1,000 mi. downstream and 10 min. after landing.



AVIATION WEEK, May 26, 1968